



Forest Insect & Disease Management

Evaluation Report

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SEED-BORNE PATHOGENS OF HEMLOCK SEED
FROM THE ARGONNE EXPERIMENTAL FOREST

by

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INTRODUCTION

Eastern hemlock, Tsuga canadensis (L.) Carr. is important in wildlife management. It provides good cover to both game and non-game animals and is a preferred browse species (Wood 1979). Also, as the supply of other softwood species decreases and as the ability to produce quality hemlock increases, hemlock may become more valuable as a timber species.

Land managers in the Lake States name poor regeneration as one of the major problems in hemlock management. Some of the causes of poor regeneration are: 1) low seed germination percentages, 2) death of young seedlings soon after germination and 3) deer browsing on seedlings.

State and Private Forestry was asked to investigate the possibility that seed-borne pathogens are causing the death of young seedlings.

METHODS

Hemlock seeds from the Nicolet National Forest were provided by Dick Godman, Geneticist, North Central Forest Experiment Station, Rhinelander, Wisconsin. The seed was x-rayed for 70 seconds, at a distance of 27 in at 15 k.v. and 1 ma using type-M x-ray film to determine if the seeds were filled.

One hundred filled seeds were sent to the St. Paul Field Office for isolation of possible seed-borne pathogens.

The seeds were initially surface sterilized by placing them in 70 percent alcohol for 10 minutes. The seedcoat and

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embryo were then separated and both portions further sterilized with ten percent Clorox (sodium hypochlorite) ^{1/} for ten minutes. They were then rinsed in sterile distilled water for one minute. Forty seeds thus treated were placed on PCNB Agar to selectively isolate Fusarium and forty were placed on acidified potato dextrose agar (PDA) to ensure that the PCNB was not killing other pathogens present in the tissues.

Fungi suspected of being Fusarium were transferred to scratch PDA (potato dextrose agar made from fresh potatoes as opposed to PDA produced commercially) and incubated under fluorescent light at 24 C. Fusarium sp. were identified by the author and verified by Carol Windels, Department of Plant Pathology, University of Minnesota. Other fungi were verified by Elwin Stewart, of the same department, University of Minnesota.

RESULTS

Fusarium moniliforme Sheld. was the only pathogen isolated from the seed. It was isolated from four out of forty seeds (10 percent) when PCNB was used as the isolation medium and from two out of forty seeds (5 percent) when acidified PDA was used. It was recovered twice from embryonic tissues and six times from the seedcoat.

F. moniliforme was recovered only when the harshest surface sterilization was used. When concentrations of Clorox of less than 10 percent were used or when the seedlings were sterilized with 10 percent Clorox for one minute, only Aureobasidium pullulans (deB.) Arn. was isolated. Even with the harshest sterilization schedule, Aureobasidium was isolated from 73 percent of the seeds (seedcoat) when PDA was used as the isolation medium and from 38 percent of the seeds (twice from embryonic tissues and 13 times from seedcoats) on PCNB.

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DISCUSSION

Fusarium moniliforme is a major pathogen of rice, sugarcane, maize and sorghum and has hosts in 31 other families of plants including the Coniferae (Booth 1971). However, the reported cases of this fungus as a root rot or seed-borne pathogen of conifers are limited. It has been implicated in root rot and damping-off of longleaf pine in Louisiana causing losses of up to 55 percent of the seedlings nine weeks after planting (Pawuk 1974, 1978).

CONCLUSIONS

Because it was isolated from 10 percent of the seed examined, F. moniliforme should be considered a possible contributing factor in seedling mortality. However, the low frequency with which it was isolated indicates that it probably was not the major factor involved.

Aureobasidium pullulans is a common saprophyte and often found on seeds and aerial parts of plants (Neergaard 1977; Pugh and Buckley 1971). It is probably not involved in hemlock regeneration problems.

RECOMMENDATIONS

A survey should be conducted to determine other factors contributing to hemlock seedling mortality.

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